Module 4.2

Curves and Hills

Curves and Hills Objectives

- Know what a curve is
- Know how to recognize an approaching curve
- Be able to recognize different types of curves
- Understand that hills are curves of a different sort

Curves and Hills Objectives

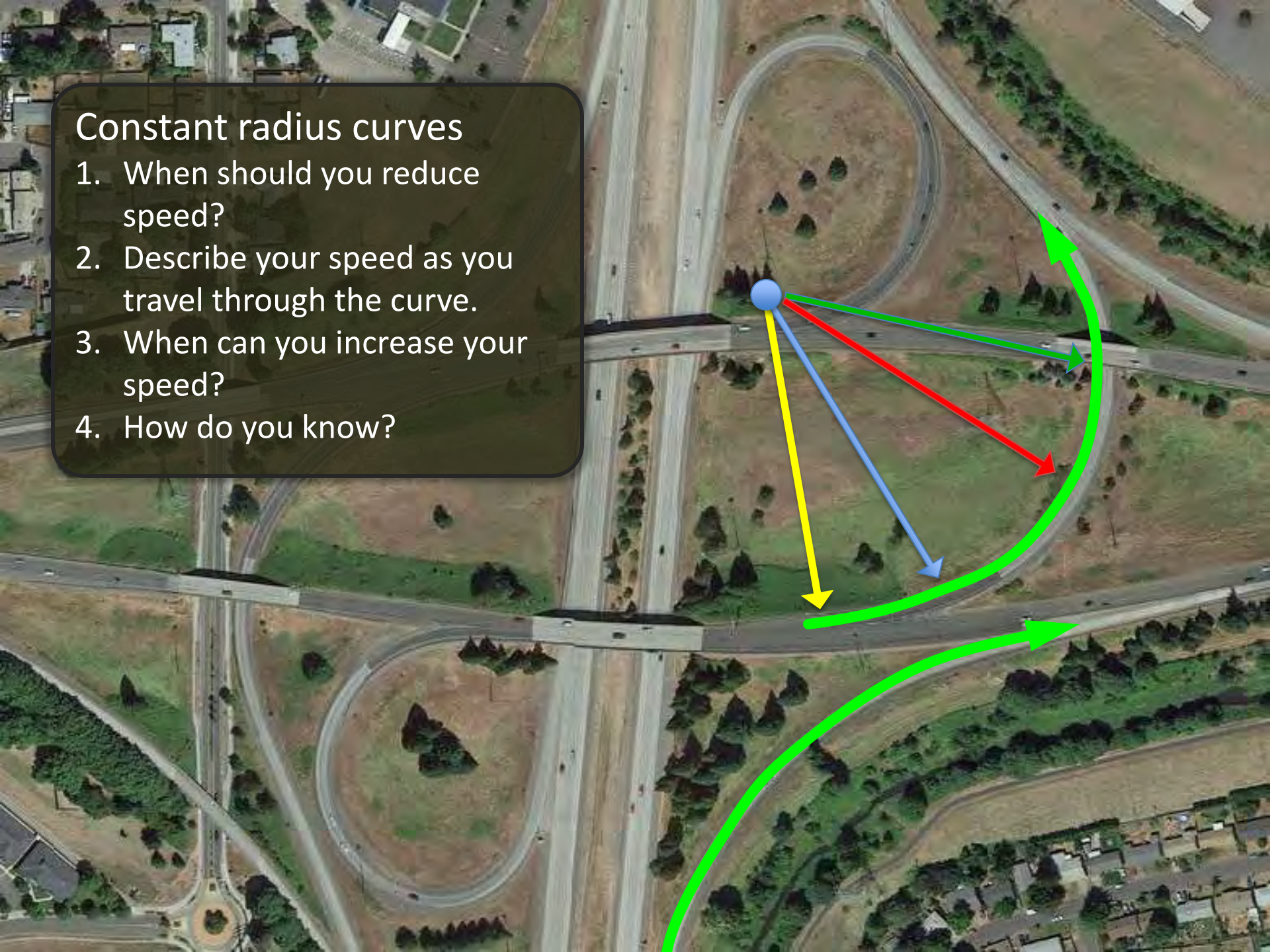
- Identify factors that contribute to risk in curves
- Understand how altitude affects vehicles and drivers

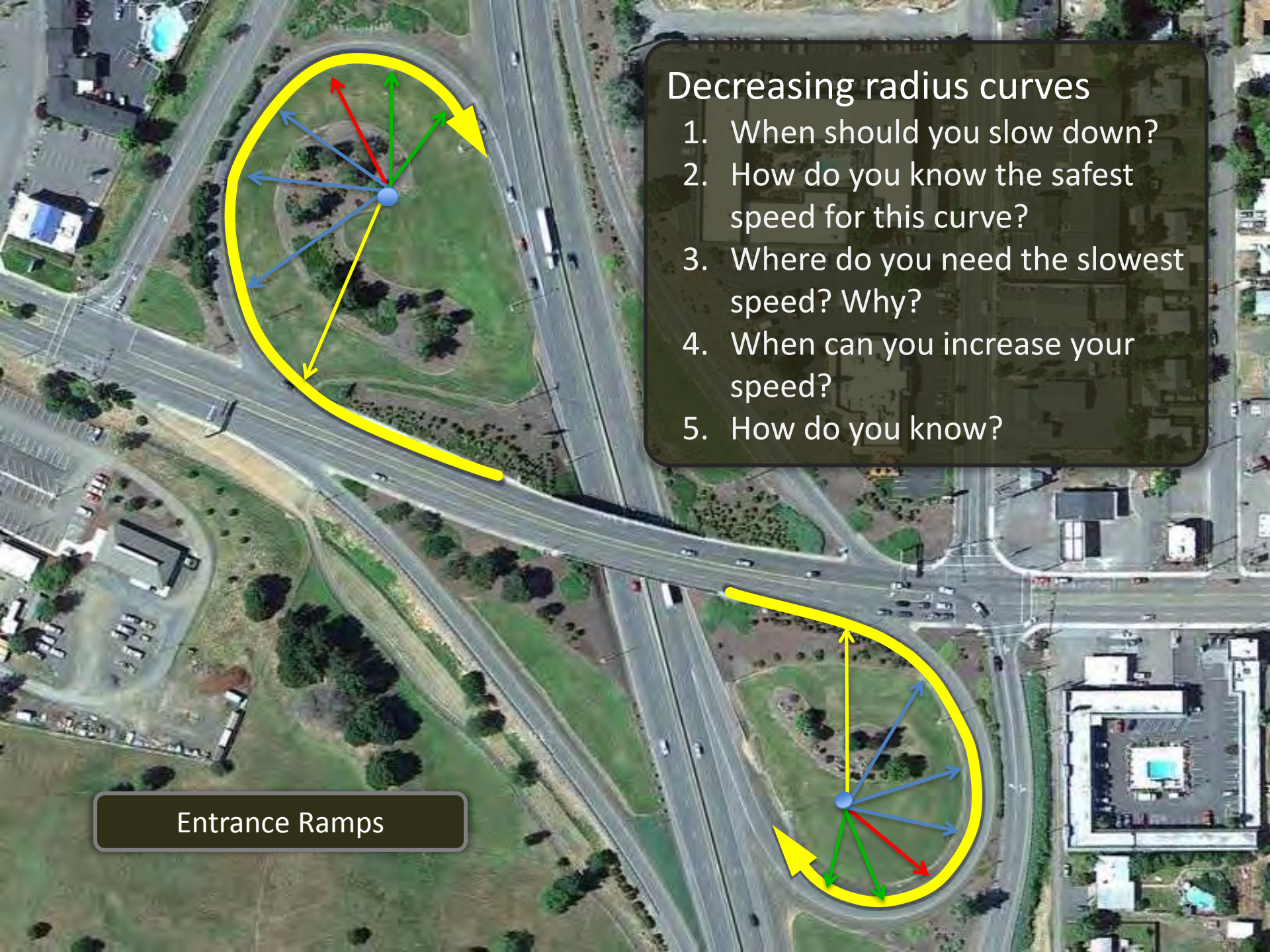
Types of Curves

- Constant Radius
- Decreasing Radius
- Increasing Radius

Constant radius curves

1. When should you reduce speed?
2. Describe your speed as you travel through the curve.
3. When can you increase your speed?
4. How do you know?



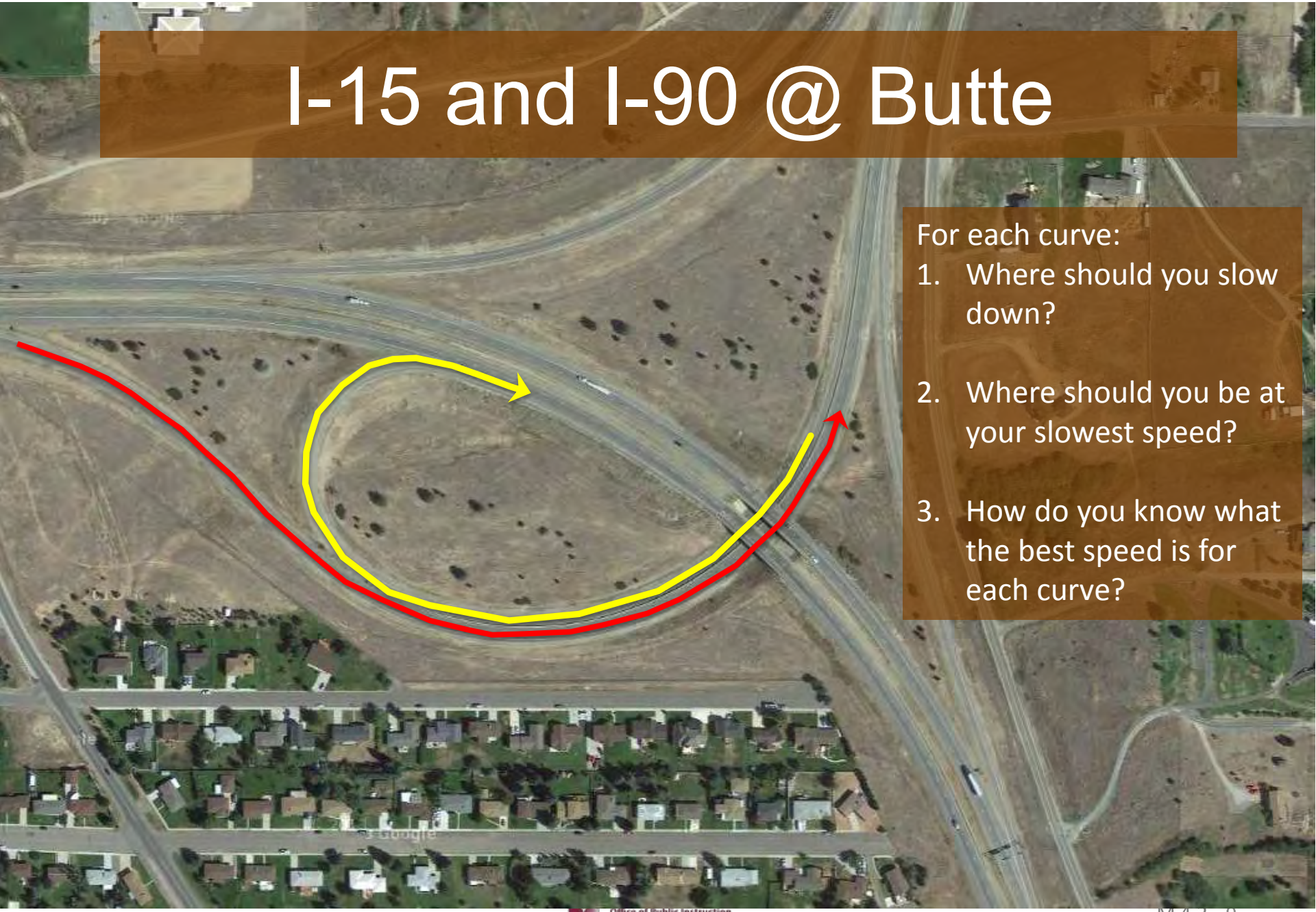

Decreasing radius curves
1. When should you slow down?
2. How do you know the safest speed for this curve?
3. Where do you need the slowest speed? Why?
4. When can you increase your speed?
5. How do you know?
Entrance Ramps

Increasing radius curves

1. Where should you begin to slow down?
2. Where is your slowest speed for this curve?
3. How do you know what the best speed is for this curve?

Exit Ramps

I-15 and I-90 @ Butte

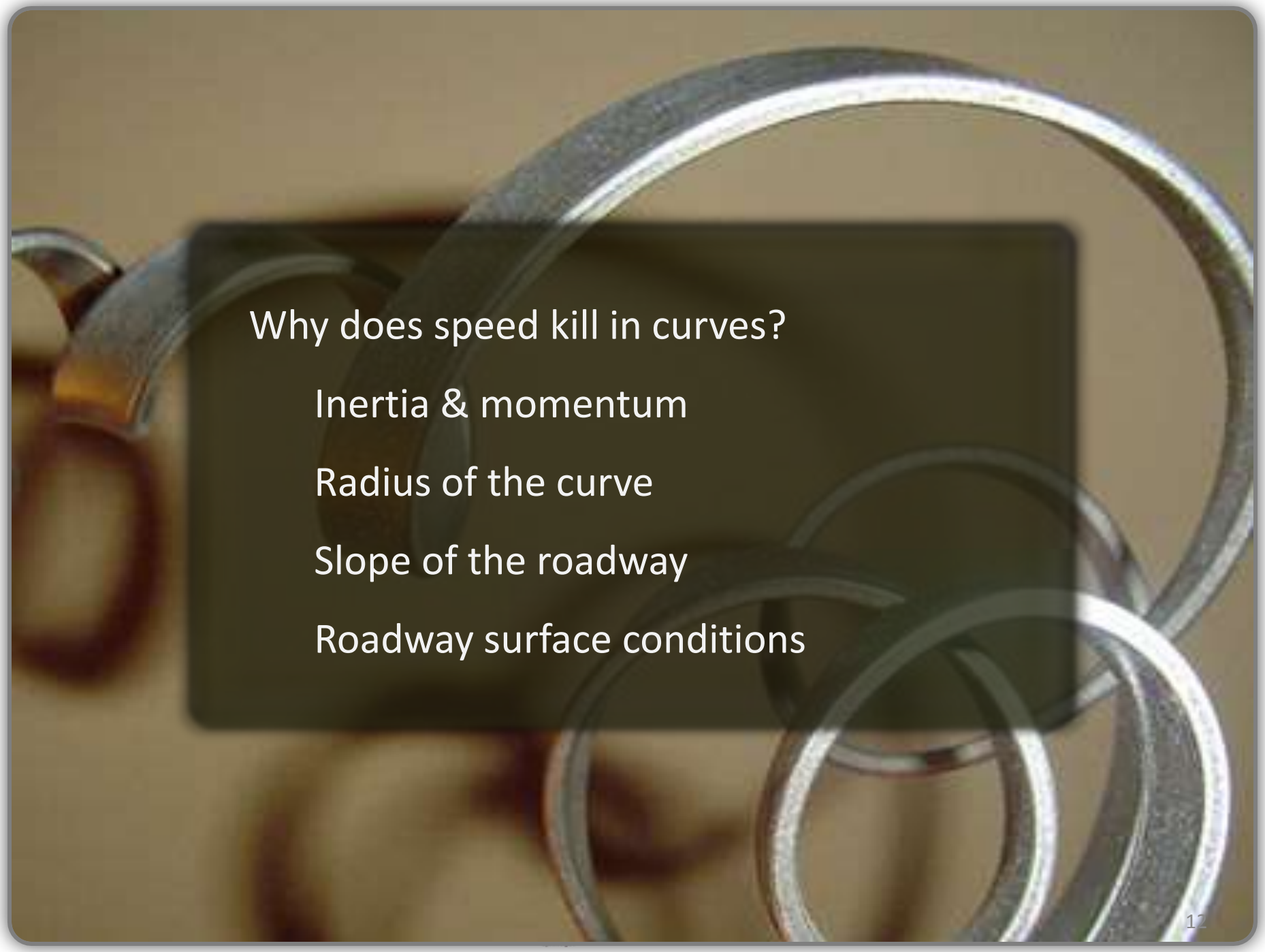


For each curve:

1. Where should you slow down?
2. Where should you be at your slowest speed?
3. How do you know what the best speed is for each curve?

What Type of Curve?

SPEED IN A CURVE


Why does speed kill in curves?
Inertia & momentum
Radius of the curve
Slope of the roadway
Roadway surface conditions

Oregon Department of Transportation
Transportation Safety Divsion

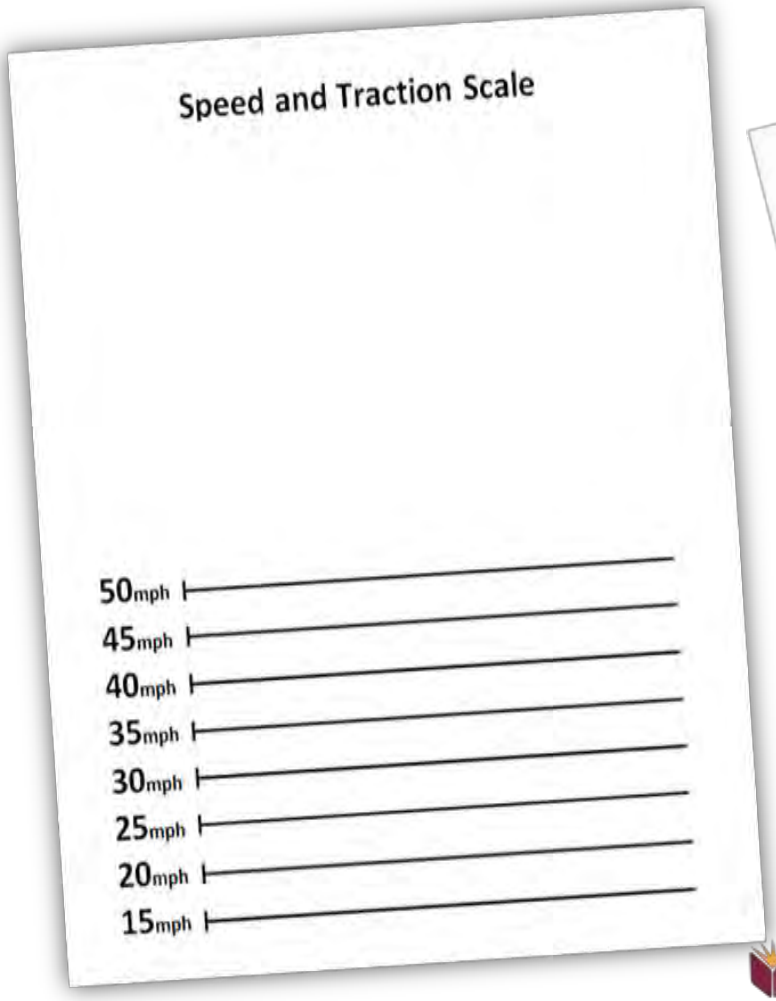
Curves: Speed, Camber, & Vehicle Load

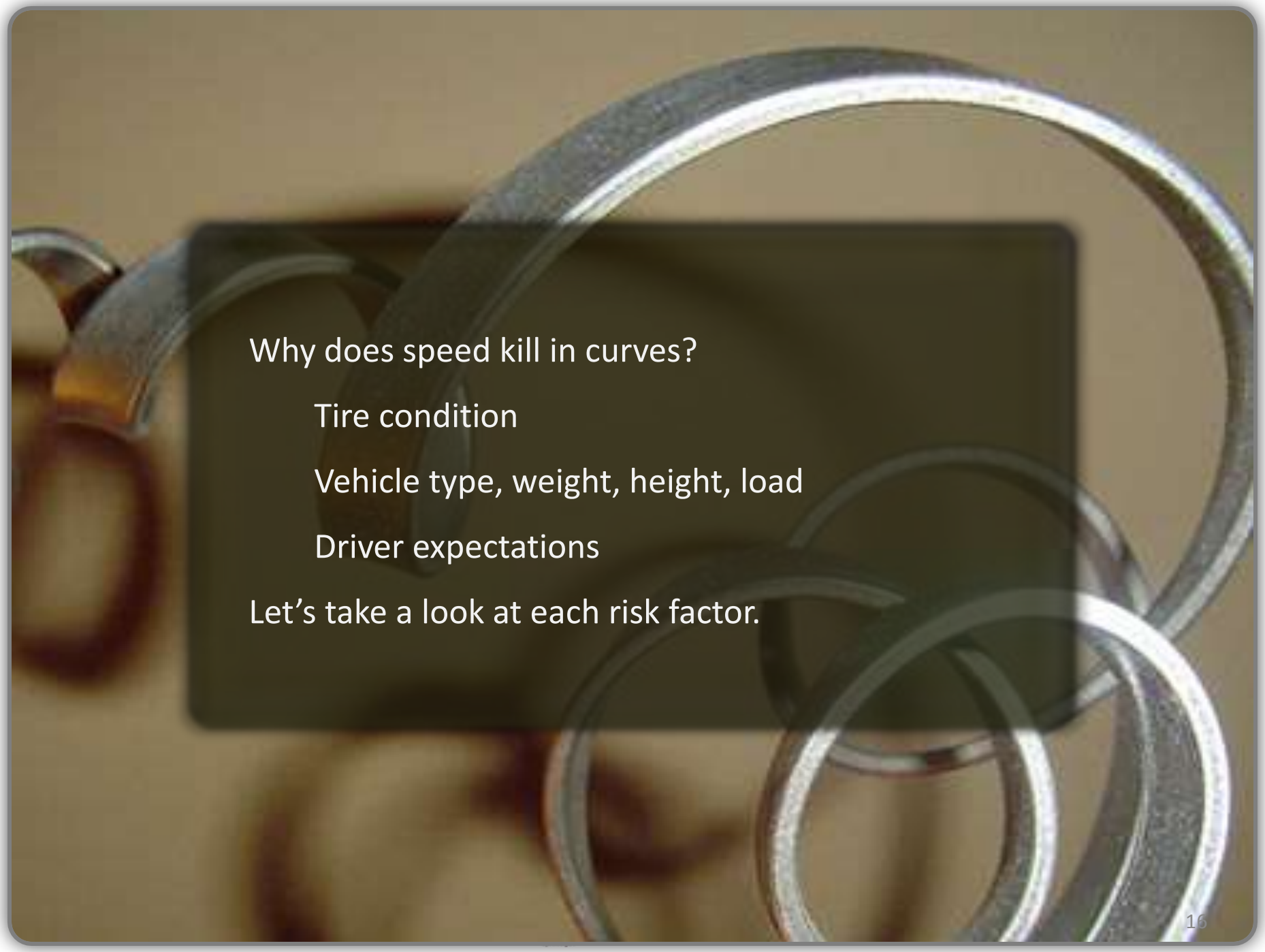
Let us experiment with speed limitations.

Curves: Speed, Camber, & Vehicle Load

<u>Small Group Experiment</u>: Use 2½ mph increments to determine…

1. the maximum speeds at which your car maintains traction, with and without a load.
2. the minimum speeds at which your car looses traction, with and without a load.
3. the speed differences between maintaining and loosing control, with and without a load.




Why does speed kill in curves?
Tire condition
Vehicle type, weight, height, load
Driver expectations
Let’s take a look at each risk factor.

WHAT CONTRIBUTES TO RISK IN A CURVE?

Vehicle Contributes to Risk

Width

Length

Height

Velocity

Weight

Condition of Tread

Type of Tires

Center of Gravity

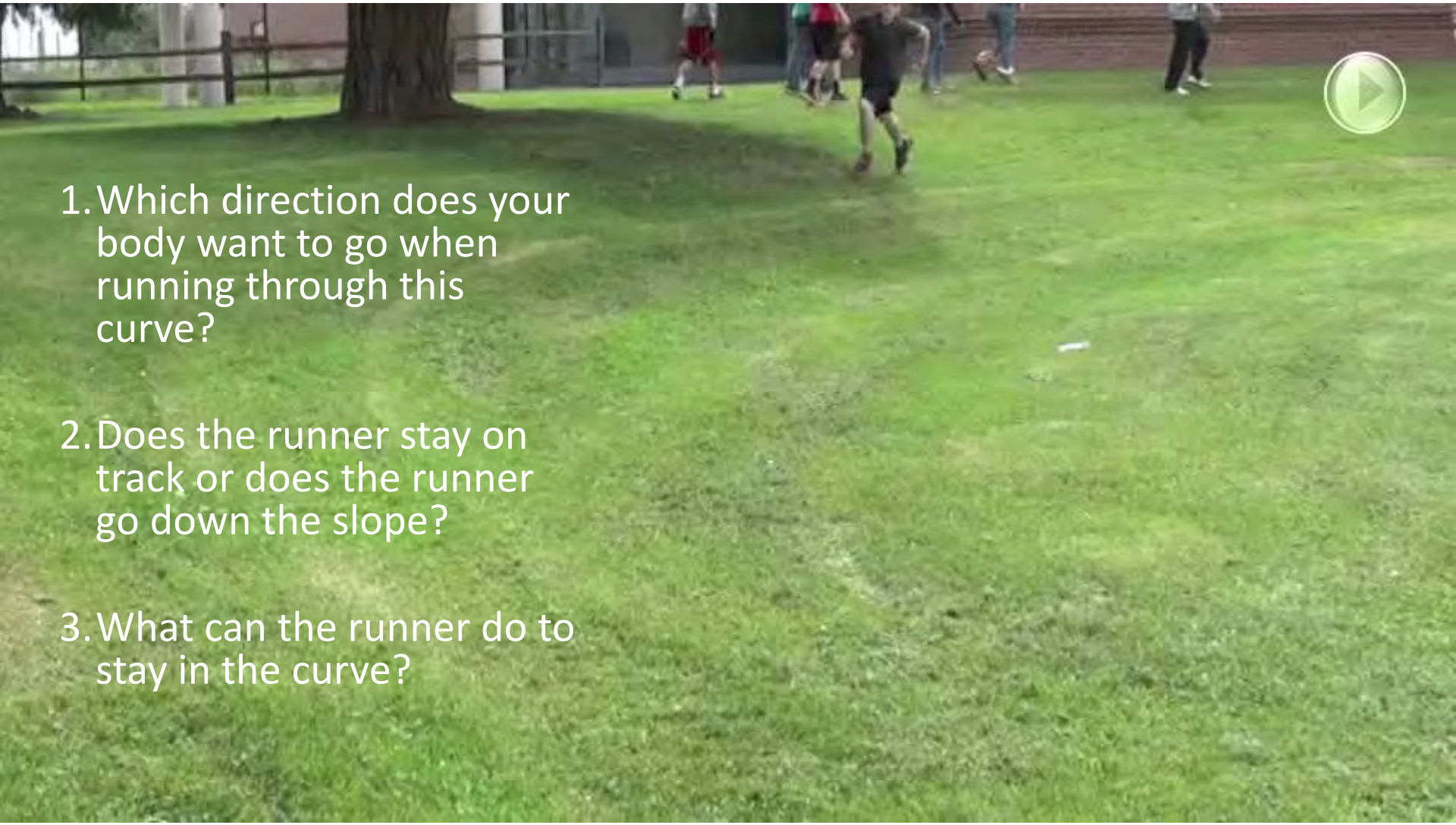
Tire Inflation

Load Distribution

And More!

Roadway Design

Positive Slope



1. Which direction does your body want to go when running through this curve?

2. Does the runner stay on track or does the runner go down the slope?

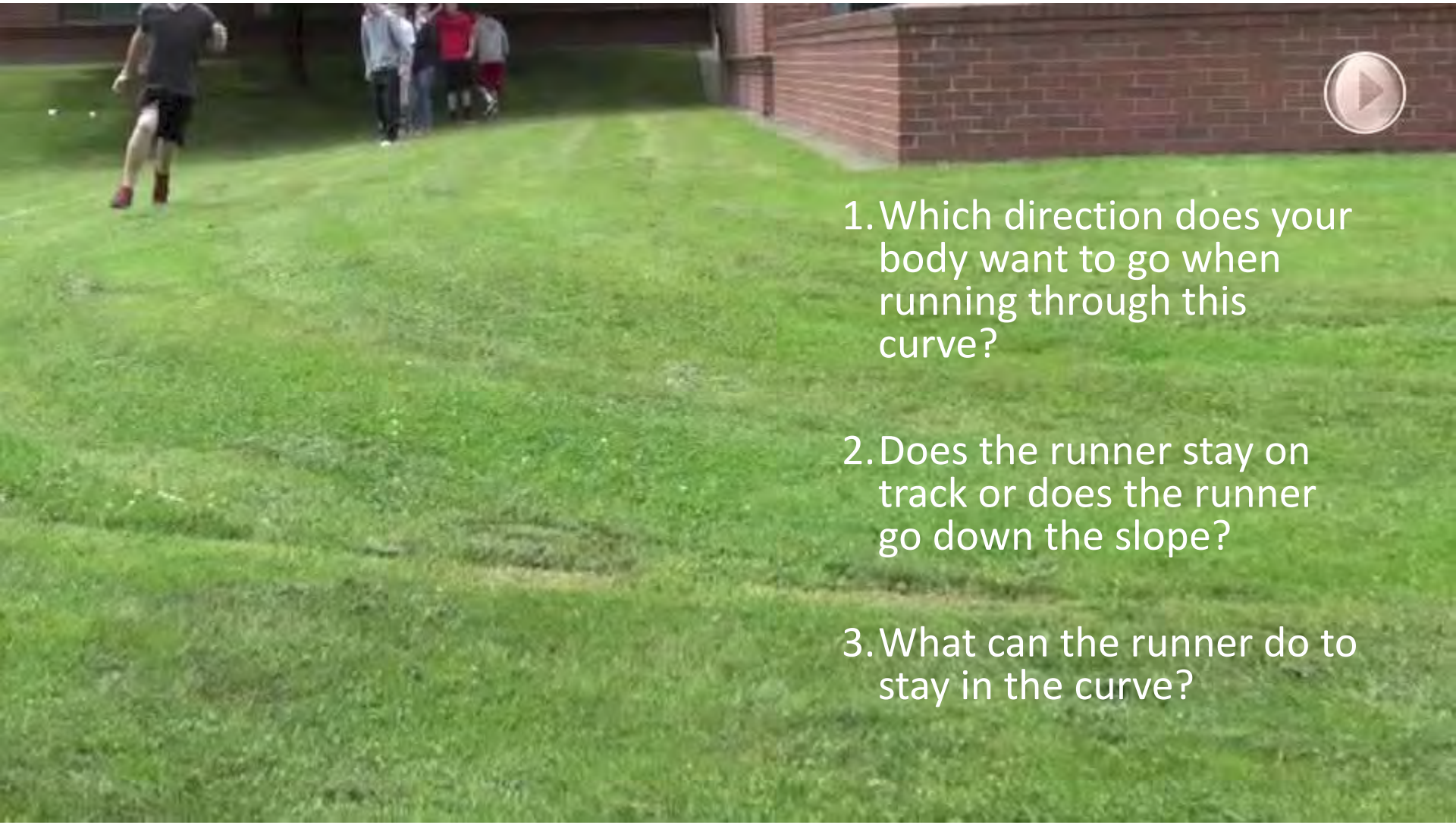
3. What can the runner do to stay in the curve?

Roadway Design

Positive Slope

Roadway Design

Negative Slope



1. Which direction does your body want to go when running through this curve?

2. Does the runner stay on track or does the runner go down the slope?

3. What can the runner do to stay in the curve?

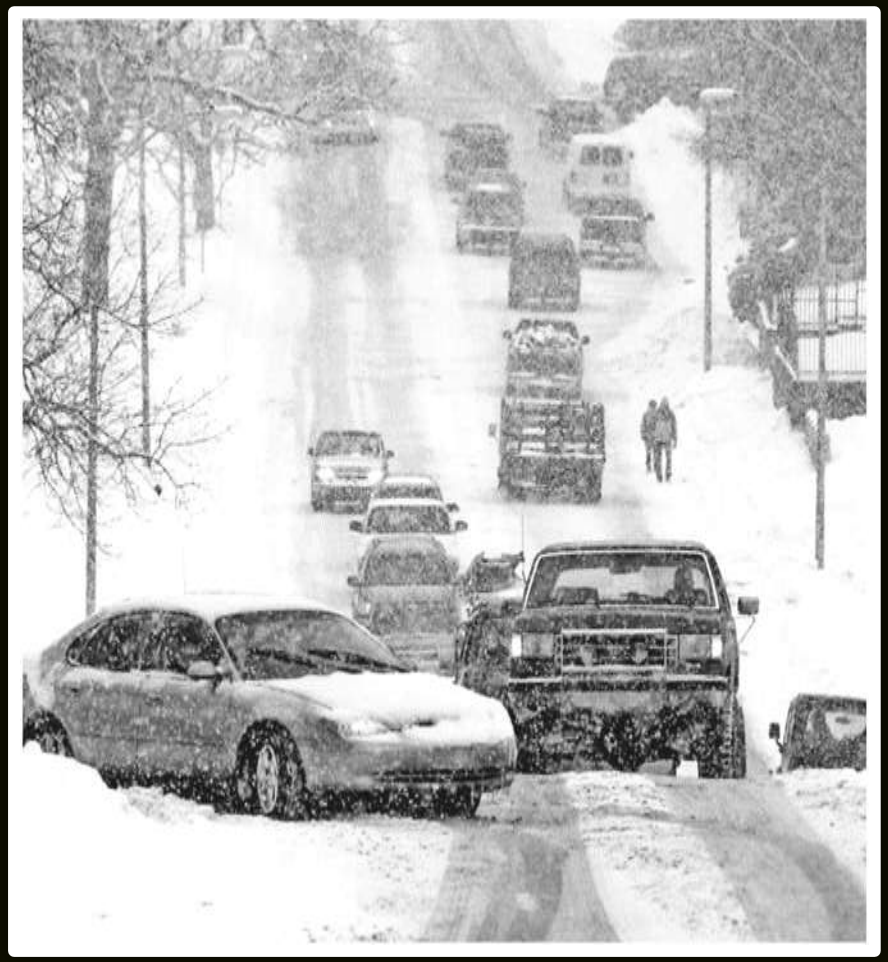
Roadway Design

Negative Slope

Roadway Design and Vehicle Load

Roadway Surface Contributes Risks

Each surface demands a different level of traction and contributes to a unique and dangerous layer of risk!



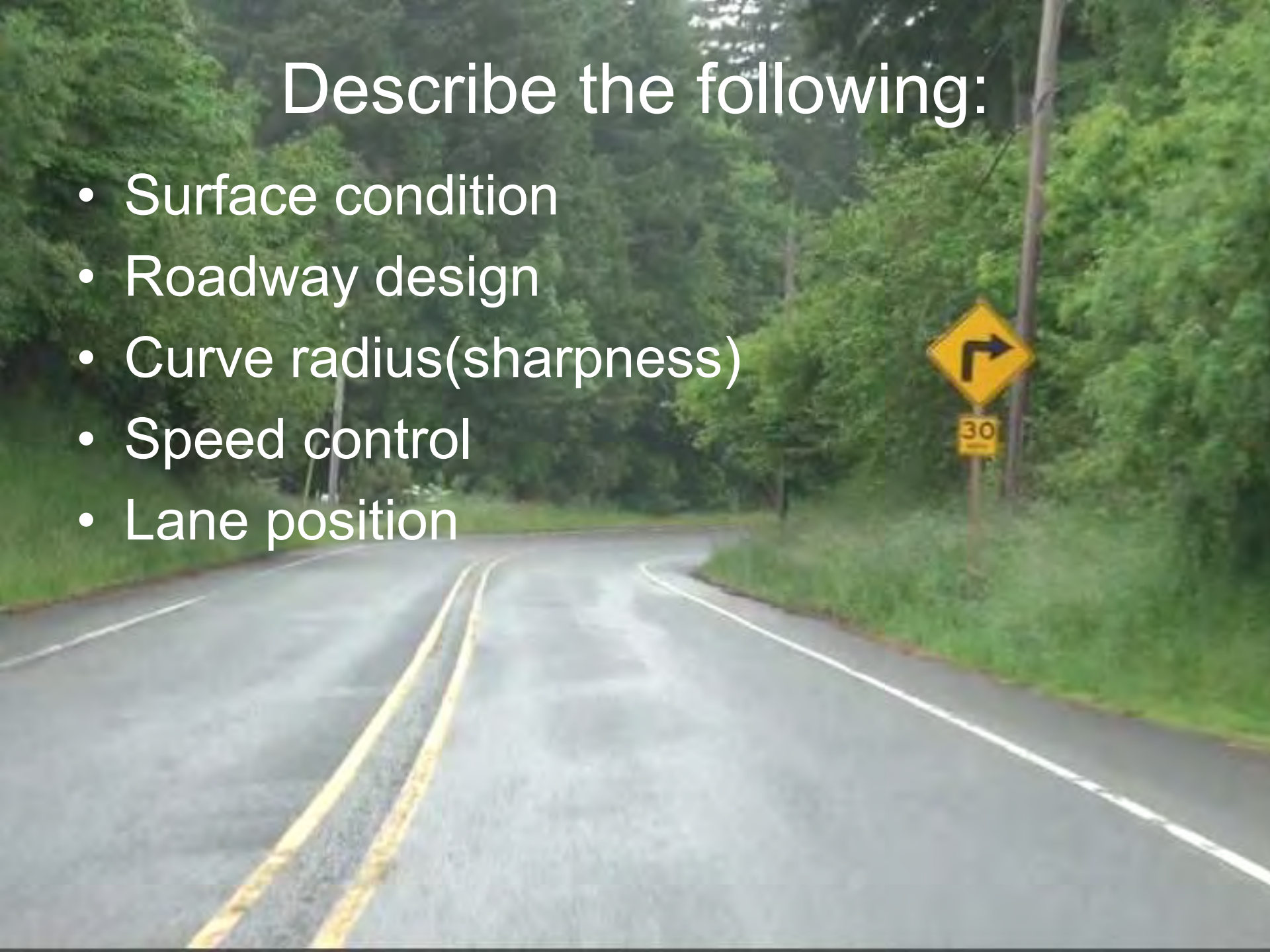
Activity: Working groups of 2 or 3, identify and write down as many different road surface conditions as you can think of.

Share your list with the class.

Describe the following:

Describe the following:

- Surface condition
- Roadway design
- Curve radius(sharpness)
- Speed control
- Lane position



Describe the following:

- Surface condition
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Describe the following:

- Surface condition
- Roadway design
- Curve radius(sharpness)
- Speed control
- Lane position

ZONE CONTROL FOR CURVES

FIND

Clues for Curves

What clues do you see that a curve is ahead?

SOLVE

Solve – Speed Control

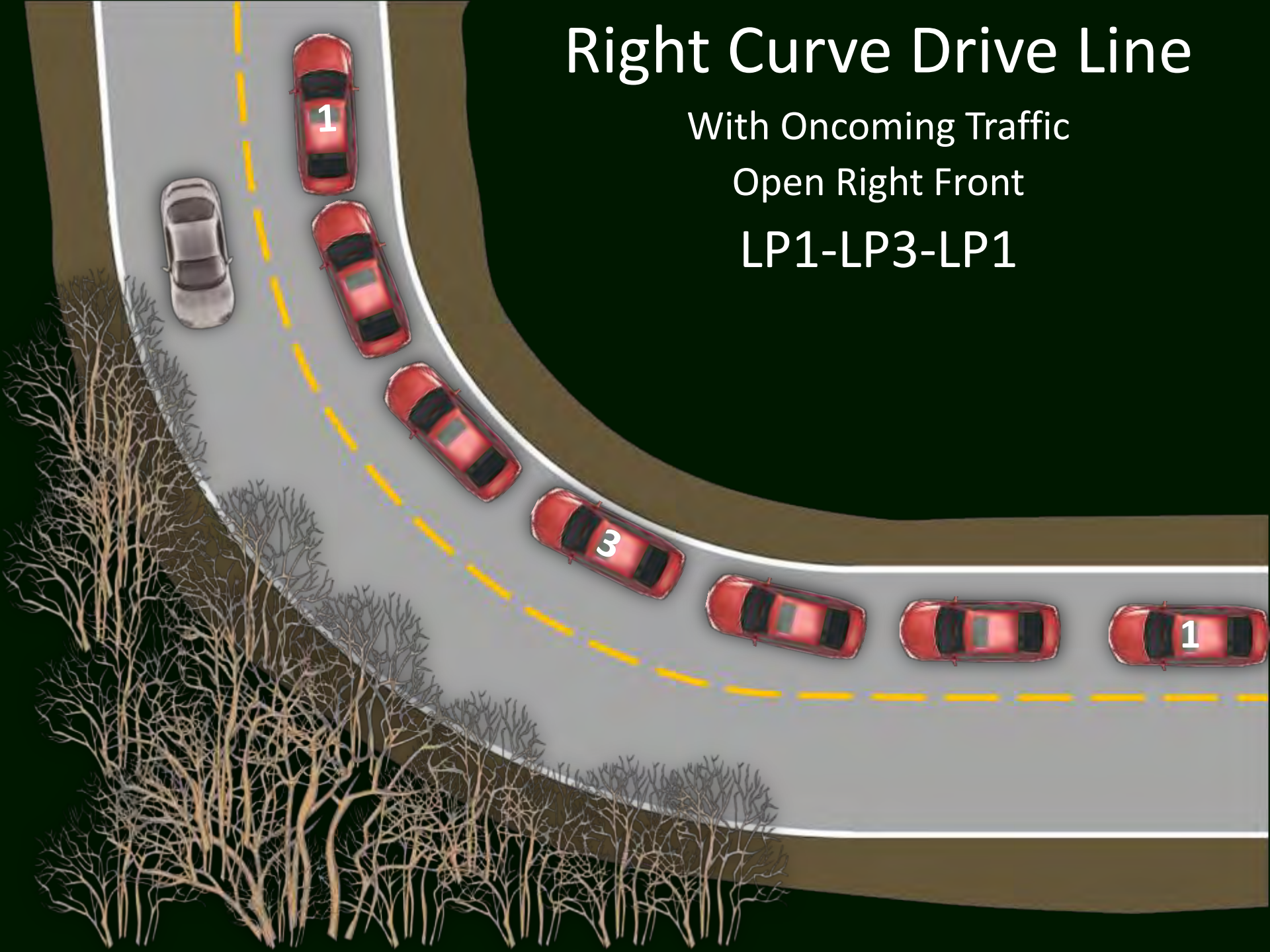
- Speed (Motion) Control
  - What is my best speed for this curve?
  - How do I know what my best speed is for this curve?
  - How do manage my speed for this curve?

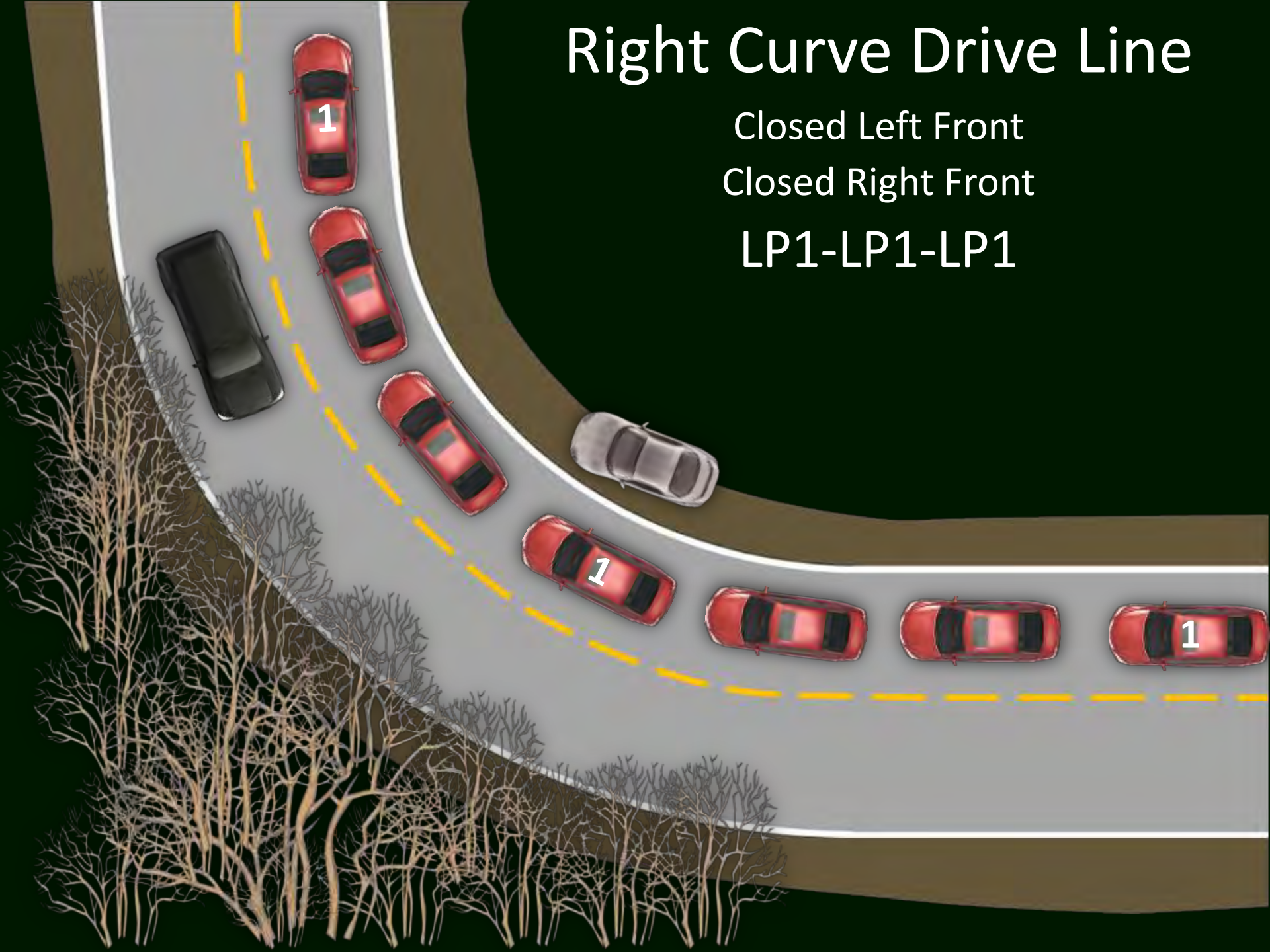
Solve – Steering Control

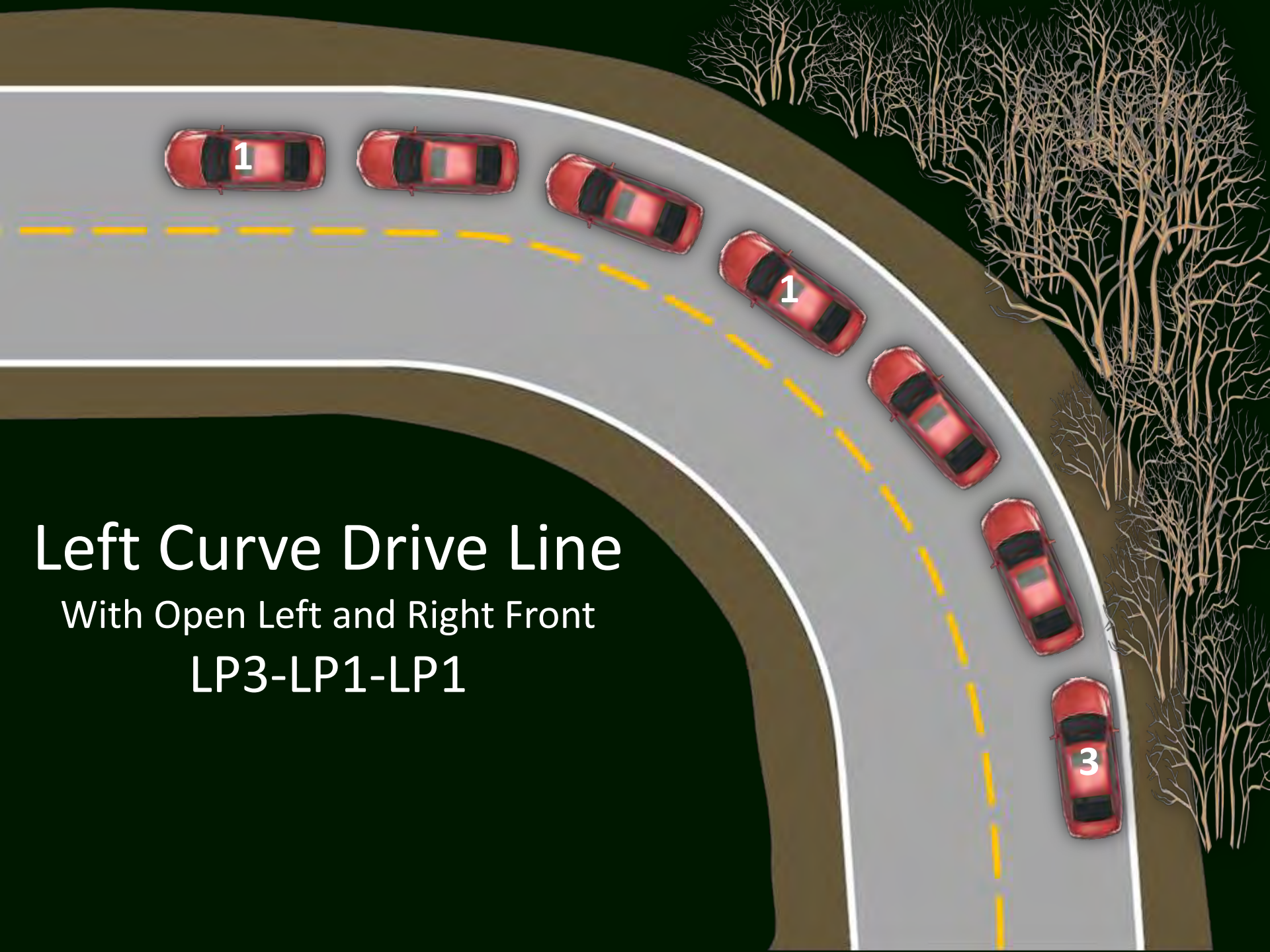
- Steering Control
  - What is my best lane position to enter this curve?
  - What is my best lane position for driving through the curve?
  - How do I manage my speed for this curve?

CONTROL—DRIVELINE


Right Curve Drive Line
No Oncoming Traffic
Open Right Front
LP2-LP3-LP1
1
3
2


Right Curve Drive Line
With Oncoming Traffic
Open Right Front
LP1-LP3-LP1
1
3
1

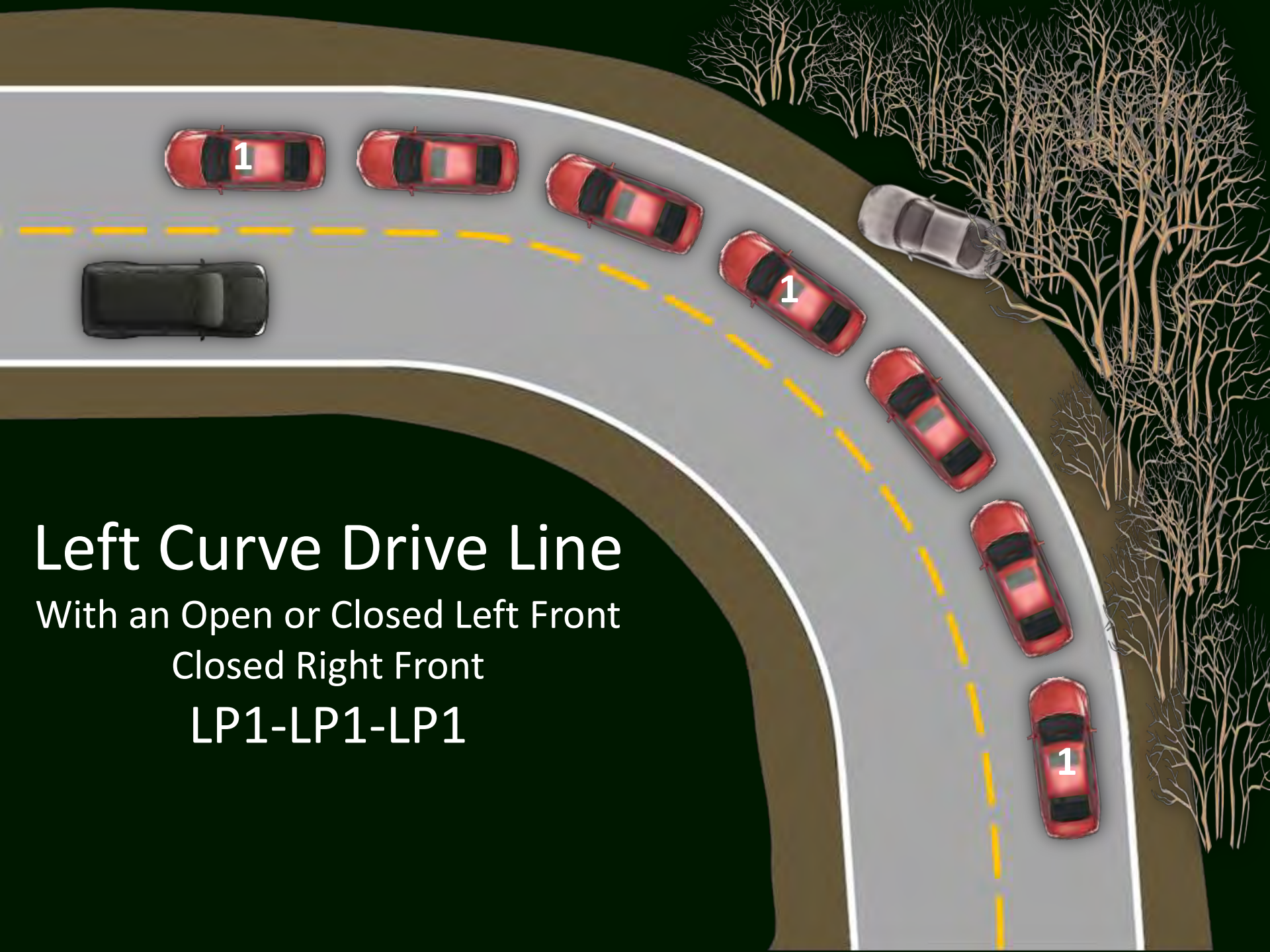

Right Curve Drive Line
Closed Left Front
Closed Right Front
LP1-LP1-LP1
1
1
1



Left Curve Drive Line

With Open Left and Right Front

LP3-LP1-LP1



Left Curve Drive Line

With an Open or Closed Left Front

Closed Right Front

LP1-LP1-LP1

Vision Control and Driveline

HILLS

Hills and Mountains

- A hill can rise and descend gently, or can be part of a mountain range
- Gravity is every driver's passenger when traveling up and down hills

Adjusting Your Speed for Uphill

Slow Moving Vehicles

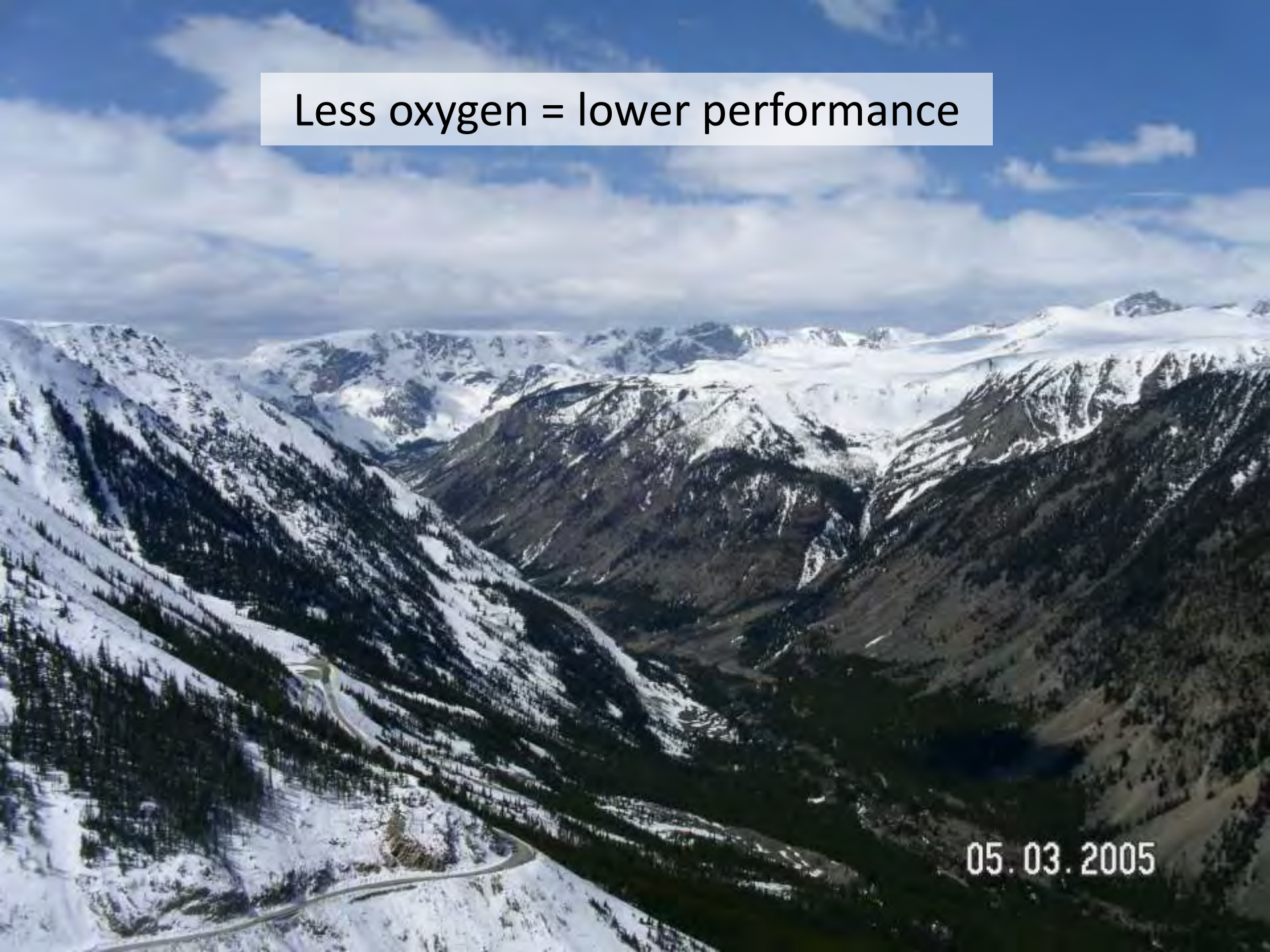
HILLS—DOWNHILL

Speed Control—Where?

Speed Control—What?

- Off Accelerator
- Trail brake on and off
- Controlled Braking
- Downshift to a lower gear both automatic and standard transmission

ALTITUDE


Less oxygen = lower performance
05.03.2005

Montana Driver Education and Training
Standards and Benchmarks

1. **Laws and Highway System**
   - 1.1. know the laws outlined in the Montana Driver's manual;
   - 1.2. understand the laws outlined in the Montana Driver's Manual; and
   - 1.3. consistently demonstrate knowledge and understanding by responsible adherence to highway transportation system traffic laws and control devices.
2. **Responsibility**
   - 2.1. recognize the importance of making safe and responsible decisions for owning and operating a motor vehicle;
   - 2.2 demonstrate the ability to make appropriate decisions while operating a motor vehicle;
   - 2.3. consistently display respect for other users of the highway transportation system; and
   - 2.4. develop positive habits and attitudes for responsible driving.
3. **Visual Skills**
   - 3.1. know proper visual skills for operating a motor vehicle;
   - 3.2. communicate and explain proper visual skills for operating a motor vehicle;
   - 3.3. demonstrate the use of proper visual skills for operating a motor vehicle; and
   - 3.4. develop habits and attitudes with regard to proper visual skills.
4. **Vehicle Control**
   - 4.1. demonstrate smooth, safe and efficient operation of a motor vehicle; and
   - 4.2. develop positive habits and attitudes relative to safe, efficient and smooth vehicle operation.

(continued on next slide)

Montana Driver Education and Training
Standards and Benchmarks

5. Communication

5.1. consistently communicate driving intentions (i.e., use of lights, vehicle position, and personal signals);

5.2. adjust driver behavior based on observation of the highway transportation system and other roadway users;

5.3. adjust communication (i.e., use of lights, vehicle position, and personal signals) based on observation of the highway transportation system and other users; and

5.4. develop positive habits and attitudes for effective communication.

6. Risk Management

6.1. understand driver risk-management principles;

6.2. demonstrate driver risk-management strategies; and

6.3. develop positive habits and attitudes for effective driver risk-management.

7. Lifelong Learning

7.1. identify and use a range of learning strategies required to acquire or retain knowledge, positive driving habits, and driving skills for lifelong learning;

7.2. establish learning goals that are based on an understanding of one's own current and future learning needs; and

7.3. demonstrate knowledge and ability to make informed decisions required for positive driving habits, effective performance, and adaptation to change.

8. Driving Experience

8.1. acquire at least the minimum number of BTW hours over at least the minimum number of days, as required by law, with a Montana-approved driver education teacher; and

8.2. acquire additional behind-the-wheel driving experience with a parent or guardian's assistance in a variety of driving situations (i.e., night, adverse weather, gravel road, etc.).